

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A tube guide for a ball screw wherein the ball screw comprises a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, wherein the plurality of balls is scooped up at the ball scooping portion so as to circulate along an outer surface of the nut, a tube guide insertion hole is formed on the nut at a position where the ball scooping portion is inserted, and the tube guide is used for mounting the ball circulation tube onto the nut, the tube guide comprising:

a top surface;

a bottom surface; and

a side surface connecting the top surface and the bottom surface,

wherein a scooping portion insertion hole is formed so as to penetrate from the top surface to the bottom surface,

the ball scooping portion is inserted into the scooping portion insertion hole,

the side surface has a shape matched to an inner shape of a tube guide insertion hole, and

the scooping portion insertion hole has an inner shape matched to an outer shape of the ball scooping portion, and

wherein the tube guide is made of resin.

2. (Previously Presented) The tube guide as set forth in claim 1, wherein the side surface is formed in a cylindrical shape.

3. (Previously Presented) The tube guide as set forth in claim 2, wherein an axial line of the cylindrical shape is set perpendicular to an axial line of the nut.

4. (Previously Presented) The tube guide as set forth in Claim 1, wherein the scooping portion insertion hole has a ball circulation passage scooping angle set so as to correspond to a lead angle of the ball screw.

5. (Previously Presented) The tube guide as set forth in Claim 2, wherein the scooping portion insertion hole has a ball circulation passage scooping angle set so as to correspond to a lead angle of the ball screw.

6. (Previously Presented) The tube guide as set forth in Claim 3, wherein the scooping portion insertion hole has a ball circulation passage scooping angle set so as to correspond to a lead angle of the ball screw.

7. (Previously Presented) The tube guide as set forth in Claim 1, wherein the tube guide is made of elastic material.

8. (Previously presented) The tube guide as set forth in Claim 2, wherein the tube guide is made of elastic material.

9. (Previously Presented) The tube guide as set forth in Claim 3, wherein the tube guide is made of elastic material.

10. (Previously Presented) The tube guide as set forth in Claim 6, wherein the tube guide is made of elastic material.

11. (Currently Amended) A ball screw comprising:

a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof;

a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof;

a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves;

a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along an outer surface of the nut ; and

a tube guide via which the ball circulation tube is mounted onto the nut,

wherein the tube guide is made of resin and comprises:

a top surface;

a bottom surface; and

a side surface connecting the top surface and the bottom surface,

wherein a scooping portion insertion hole is formed so as to penetrate from the top surface to the bottom surface,

the ball scooping portion is inserted into the scooping portion insertion hole,

a tube guide insertion hole is formed on the nut at a position where the ball scooping portion is inserted,

the side surface has a shape matched to an inner shape of a tube guide insertion hole, and

the scooping portion insertion hole has an inner shape matched to an outer shape of the ball scooping portion.

12. (Previously Presented) The ball screw as set forth in claim 11, wherein the inner shape of the tube guide insertion hole is formed in a cylindrical shape:

13. (Previously Presented) The ball screw as set forth in claim 12, wherein an axial line of the cylindrical shape is set perpendicular to an axial line of the nut.

14. (Previously Presented) The ball screw as set forth in claim 11, wherein the scooping portion insertion hole has a ball circulation passage scooping angle set so as to correspond to a lead angle of the ball screw .

15. (Previously Presented) The ball screw as set forth in claim 11, wherein the tube guide is made of elastic material.

16. (withdrawn) A method for manufacturing a ball screw comprising: a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along the outer surface of the nut, comprising steps of:

forming a tube guide insertion hole on the nut at a position corresponding to the insertion position of the ball scooping portion;

mounting the tube guide as set forth in Claim 1 on the two end portions of the ball circulation tube;

inserting the two end portions of the ball circulation tube with the tube guide into the tube guide insertion holes; and,

fixing the ball circulation tube to the nut.

17. (withdrawn) A method for manufacturing a ball screw comprising: a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along the outer surface of the nut, comprising steps of:

forming a tube guide insertion hole on the nut at a position corresponding to the insertion position of the ball scooping portion;

mounting the tube guide as set forth in Claim 2 on the two end portions of the ball circulation tube;

inserting the two end portions of the ball circulation tube with the tube guide into the tube guide insertion holes; and,

fixing the ball circulation tube to the nut.

18. (withdrawn) A method for manufacturing a ball screw comprising: a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along the outer surface of the nut, comprising steps of:

forming a tube guide insertion hole on the nut at a position corresponding to the insertion position of the ball scooping portion;

mounting the tube guide as set forth in Claim 3 on the two end portions of the ball circulation tube;

inserting the two end portions of the ball circulation tube with the tube guide into the tube guide insertion holes; and,

fixing the ball circulation tube to the nut.

19. (withdrawn) A method for manufacturing a ball screw comprising: a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along the outer surface of the nut, comprising steps of:

forming a tube guide insertion hole on the nut at a position corresponding to the insertion position of the ball scooping portion;

mounting the tube guide as set forth in Claim 6 on the two end portions of the ball circulation tube;

inserting the two end portions of the ball circulation tube with the tube guide into the tube guide insertion holes; and,

fixing the ball circulation tube to the nut.

20. (withdrawn) A method for manufacturing a ball screw comprising: a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along the outer surface of the nut, comprising steps of:

forming a tube guide insertion hole on the nut at a position corresponding to the insertion position of the ball scooping portion;

mounting the tube guide as set forth in Claim 10 on the two end portions of the ball circulation tube;

inserting the two end portions of the ball circulation tube with the tube guide into the tube guide insertion holes; and,

fixing the ball circulation tube to the nut.

21. (withdrawn) A method for manufacturing a ball screw comprising: a screw shaft including a spiral-shaped ball rolling groove formed in an outer peripheral surface thereof; a nut including a spiral-shaped ball rolling groove formed in an inner peripheral surface thereof; a plurality of balls disposed in a ball rolling passage formed by the two ball rolling grooves; and, a ball circulation tube forming a ball circulation passage and including a ball scooping portion in an end portion thereof, the balls being scooped up at the ball scooping portion so as to circulate along the outer surface of the nut, comprising steps of:

forming a tube guide insertion hole on the nut at a position corresponding to the insertion position of the ball scooping portion;

mounting the tube guide as set forth in Claim 15 on the two end portions of the ball circulation tube;

inserting the two end portions of the ball circulation tube with the tube guide into the tube guide insertion holes; and,

fixing the ball circulation tube to the nut.

22. (withdrawn) A method for manufacturing a ball screw as set forth in Claim 16, wherein, in a state where the two end portions of the ball circulation tube are inserted into a mold for molding a tube guide, material for the tube guide is poured into the tube guide molding mold and is hardened therein, whereby the step of manufacturing the tube guide and the step of mounting the tube guide onto the two end portions of the ball circulation tube is executed at the same time.

23. (withdrawn) A method for manufacturing a ball screw as set forth in Claim 17, wherein, in a state where the two end portions of the ball circulation tube are inserted into a mold for molding a tube guide, material for the tube guide is poured into the tube guide molding mold and is hardened therein, whereby the step of manufacturing the tube guide and the step of mounting the tube guide onto the two end portions of the ball circulation tube is executed at the same time.

24. (withdrawn) A method for manufacturing a ball screw as set forth in Claim 18, wherein, in a state where the two end portions of the ball circulation tube are inserted into a mold for molding a tube guide, material for the tube guide is poured into the tube guide molding mold and is hardened therein, whereby the step of manufacturing the tube guide and the step of mounting the tube guide onto the two end portions of the ball circulation tube is executed at the same time.

25. (withdrawn) A method for manufacturing a ball screw as set forth in Claim 19 wherein, in a state where the two end portions of the ball circulation tube are inserted into a mold for molding a tube guide, material for the tube guide is poured into the tube guide molding mold and is hardened therein, whereby the step of manufacturing the tube guide and the step of mounting the tube guide onto the two end portions of the ball circulation tube is executed at the same time.

26. (withdrawn) A method for manufacturing a ball screw as set forth in Claim 20, wherein, in a state where the two end portions of the ball circulation tube are inserted into a mold for molding a tube guide, material for the tube guide is poured into the tube guide molding mold and is hardened therein, whereby the step of manufacturing the tube guide and the step of mounting the tube guide onto the two end portions of the ball circulation tube is executed at the same time.

27. (withdrawn) A method for manufacturing a ball screw as set forth in Claim 21, wherein, in a state where the two end portions of the ball circulation tube are inserted into a mold for molding a tube guide, material for the tube guide is poured into the tube guide molding mold and is hardened therein, whereby the step of manufacturing the tube guide and the step of mounting the tube guide onto the two end portions of the ball circulation tube is executed at the same time.

28. (Previously presented) The tube guide as set forth in claim 1, wherein the top surface is chamfered in a smooth arc manner.

29. (previously presented) The ball screw as set forth in claim 11, wherein the top surface is chamfered in a smooth arc manner.

30. (previously presented) The ball screw as set forth in claim 1, wherein the tube guide is interposed between the ball scooping portion and the tube guide insertion hole without any clearance between the ball scooping portion and the tube guide insertion hole.

31. (previously presented) The ball screw as set forth in claim 11, wherein the tube guide is interposed between the ball scooping portion and the tube guide insertion hole without any clearance between the ball scooping portion and the tube guide insertion hole.